CLAIMS

We claim:

1. A micropyrolyzer for vaporization of a liquid or solid sample, comprising:

a substrate having a suspended membrane formed thereon, the membrane having a top side facing the substrate for accepting the sample; and

a resistive heating element disposed on the membrane such that the sample will be vaporized upon heating of the membrane by the resistive heating element.

2. The micropyrolyzer of claim 1 wherein the substrate is selected from the group consisting of semiconductors and dielectrics.

3. The micropyrolyzer of claim 2, wherein the substrate comprises silicon.

4. The micropyrolyzer of claim 1, wherein the membrane comprises a material selected from the group consisting of silicon nitride, polysilicon, silicon oxynitride and silicon carbide.

5. The micropyrolyzer of claim 1, wherein the resistive heating element comprises a circuitous metal trace.

6. The micropyrolyzer of claim 5, wherein the metal comprises a metal selected from the group consisting of platinum, molybdenum, titanium, chromium, palladium, gold, tungsten, and combinations thereof.

7. A method for pyrolyzing a liquid or solid sample for analysis, comprising

a) depositing the sample on a pyrolysis stage of a micropyrolyzer;

b) heating the sample in the micropyrolyzer to form a vapor; and

c) removing the vapor from the micropyrolyzer for chemical analysis of the vapor.

8. The method of claim 7, further comprising the step of introducing a reagent chemical to the sample prior to step b).

9. The method of claim 7, wherein the sample size is less than 3 microliters.

10. The method of claim 7, wherein the sample heating rate is greater than 20°C per millisecond.

11. The method of claim 7, wherein the sample heating rate is greater than 40°C per millisecond.

12. The method of claim 7, wherein the sample heating rate is greater than 60°C per millisecond.

13. The method of claim 7, wherein the sample can be heated to a temperature of up to 1000°C.

14. The method of claim 7, wherein the heating requires less than 1 Watt of power.

15. The method of claim 7, wherein the sample comprises a fatty ester, triglyceride, wax, oil, polyunsaturated fat, fatty alcohol, phenol, dipicolinic acid, carboxylic acid-containing molecule, alkaloidal narcotic, drug, drug metabolite, or herbicide.

16. The method of claim 7, wherein the sample comprises a fatty acid or a mixture containing fatty acids.

17. The method of claim 8, wherein the reagent chemical comprises a methylation reagent.

18. The method of claim 17, wherein the reagent chemical comprises tetramethylammonium acetate, trimethylphenylammonium hydroxide, phenyl-trimethylammonium fluoride, N,N-Dimethylformamide dimethyl acetal, or (m-trifluoro-methylphenyl) trimethylammonium hydroxide.

19. The method of claim 17, wherein the reagent chemical comprises tetramethylammonium hydroxide.

20. The method of claim 7, wherein the vapor is formed by pyrolysis, heated chemistry, or thermal desorption of the sample.

21. A portable analyzer for the chemical analysis of a liquid or solid sample, comprising:

a micropyrolyzer for heating the sample to produce a vapor having at least one chemical species, and

a chemical detector for detection of the at least one chemical species in the vapor.

22. The portable analyzer of claim 21, further comprising a chemical preconcentrator for sorption of the vapor from the micropyrolyzer and release of the sorbed vapor.

23. The portable analyzer of claim 22, further comprising a chemical separator for separation of the at least one chemical species in the released vapor.

24. The portable analyzer of claim 21, further comprising a chemical separator for separation of the at least one chemical species in the vapor from the micropyrolyzer.

25. The portable analyzer of claim 21, wherein the micropyrolyzer further comprises:

a substrate having a suspended membrane formed thereon, the membrane having a top side facing the substrate for accepting the sample; and

a resistive heating element disposed on the membrane such that the sample will be vaporized upon heating of the membrane by the resistive heating element.

26. The portable analyzer of claim 25, wherein the substrate is selected from the group consisting of semiconductors and dielectrics.

27. The portable analyzer of claim 26, wherein the substrate comprises silicon.

28. The portable analyzer of claim 25, wherein the membrane comprises a material selected from the group consisting of silicon nitride, polysilicon, silicon oxynitride and silicon carbide.

29. The portable analyzer of claim 25, wherein the resistive heating element comprises a circuitous metal trace.

30. The portable analyzer of claim 29, wherein the metal comprises a metal selected from the group consisting of platinum, molybdenum, titanium, chromium, palladium, gold, tungsten, and combinations thereof.

31. The portable analyzer of claim 23, wherein the chemical separator comprises a gas chromatograph column.

32. The portable analyzer of claim 24, wherein the chemical separator comprises a gas chromatograph column.

33. The portable analyzer of claim 21, wherein the chemical detector comprises a surface acoustic wave detector, mass spectrometer, spectrophotometer, flame ionization detector, or thermal conductivity detector.